

412TW-PA-15198



TECCS Version 5

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AIR FORCE TEST CENTER
EDWARDS AFB, CA

DATE 29 April 2015

Approved for public release ; distribution is unlimited.
412TW-PA-15198

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REPORT DOCUMENTATION PAGE				<i>Form Approved</i> OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) 29-APR-2015		2. REPORT TYPE Presentation		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE TECCS Version 5				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Gary Glazner				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES) 412 RANS/ENRT Edwards Air Force Base, CA				8. PERFORMING ORGANIZATION REPORT NUMBER 412TW-PA-15198	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release A: distribution is unlimited.					
13. SUPPLEMENTARY NOTES CA: Air Force Test Center Edwards AFB CA CC: 012100					
14. ABSTRACT The Test Evaluation Command and Control System (TECCS) is a flight test mission control software package developed by the 412 th Range Squadron at Edwards Air Force Base. Initially developed for Unix platforms in 1988, TECCS has now been rehosted to a modern desktop computer platform. This presentation provides an overview of the functionality built into this latest release, TECCS Version 5.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT None	18. NUMBER OF PAGES 45	19a. NAME OF RESPONSIBLE PERSON 412 TENG/EN (Tech Pubs)
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) 661-277-8615



412th Test Wing



War-Winning Capabilities ... On Time, On Cost



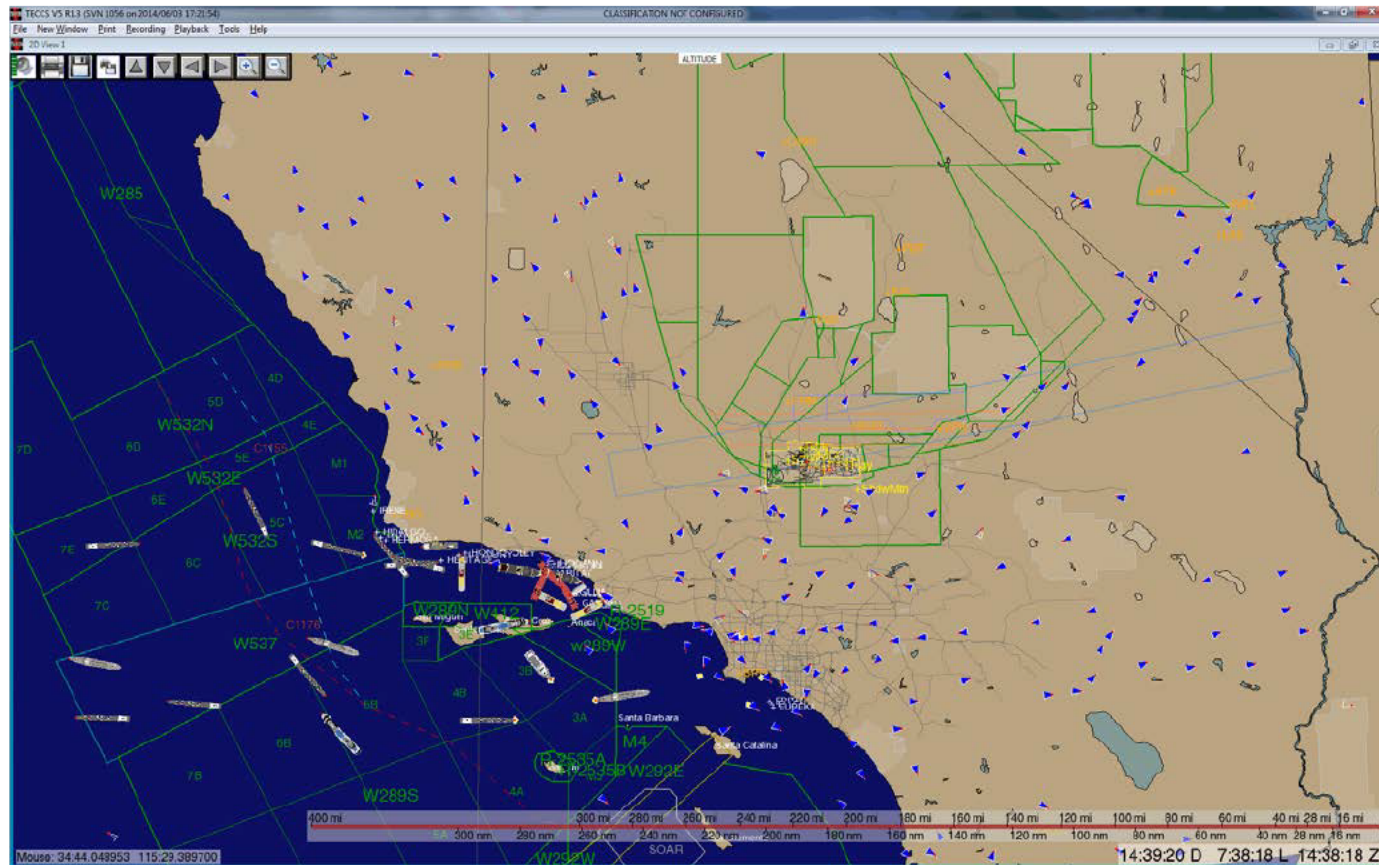
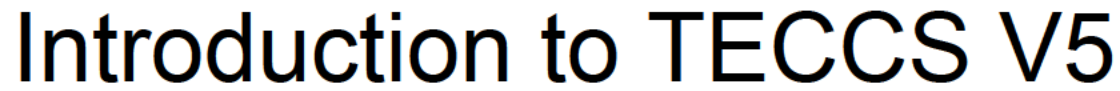
U.S. AIR FORCE

TECCS Version 5 Test Evaluation Command and Control System

Gary Glazner
412 RANS/ENRT
661-277-5369

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412TW-PA No.: 412 TW-PA-15198

Integrity - Service - Excellence



The Test Evaluation Command and Control System (TECCS) is a real time mission support system that provides a situational overview of mission participants. The system shows related ground features and provides a host of flight test tools that enable mission personnel to execute mission objectives.



TECCS



- TECCS is a software package that provides real time situational awareness along with tools necessary for effective and safe mission operation.
- TECCS provides visual and tabular displays of information as well as status and location of mission participants.
- The current version of TECCS is extremely configurable and is extensible through a plug-in architecture.
- TECCS was developed by and is maintained by the United States Air Force.



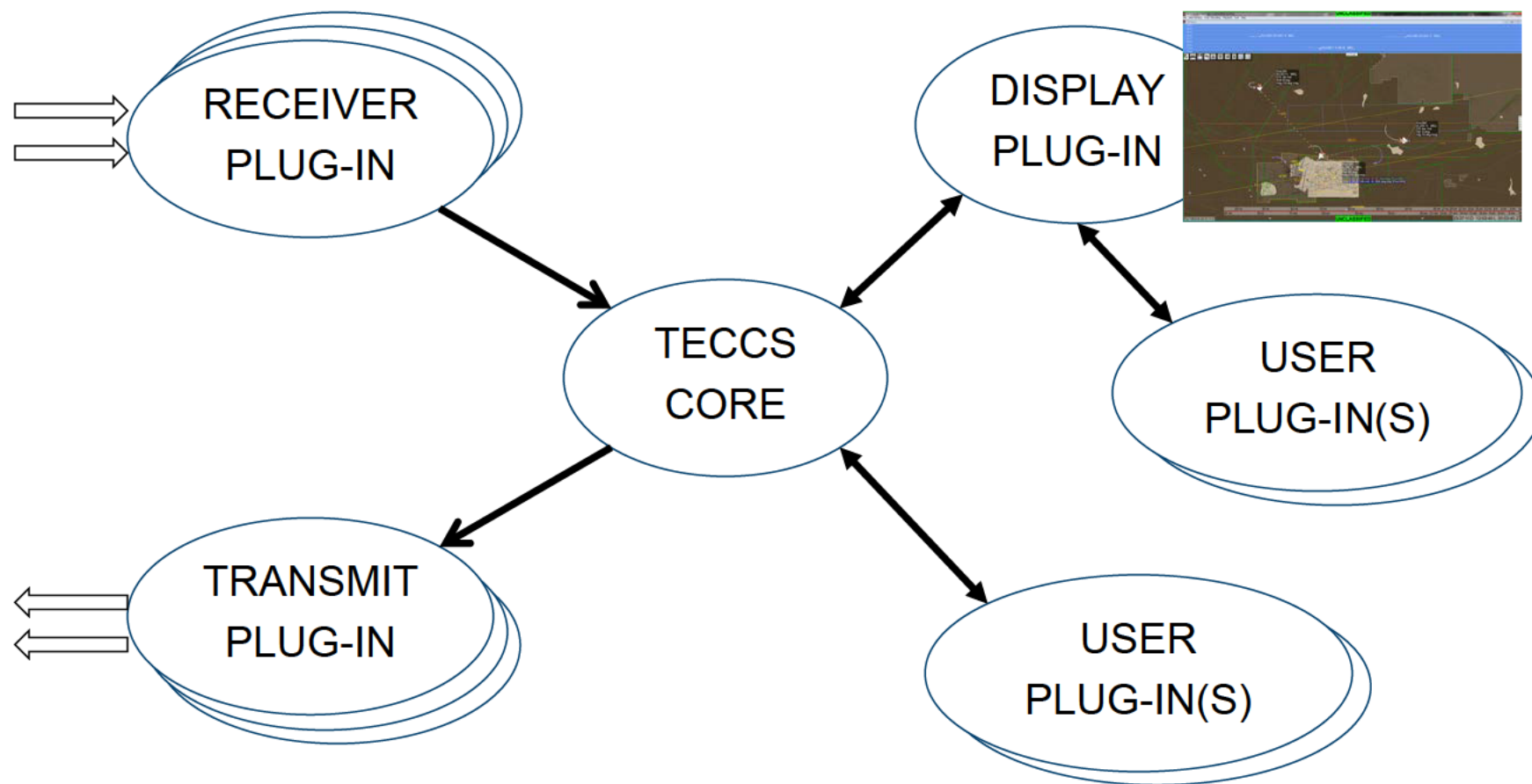
Background



- The Test Evaluation Command and Control System was initially developed in the late 1980s at Edwards Air Force Base and has been a supported software product since inception.
- It has been deployed to multiple test ranges and continues to be a primary tool for mission control, situational awareness, and range safety at Edwards AFB.
- Through TECCS Version 4, the computer used was a DEC/Compaq/HP Alpha running the Unix operating system. With Version 5, TECCS has been completely rewritten to function on a Microsoft Windows system.
- There have been multiple releases of TECCS V5 that meet special purposes or have limited utility. The latest release is R1.3a, which contains all previous functionality and is a stable baseline for future growth.



TECCS Plug-In Architecture





Out-Of-The-Box Features



- Multiple independent display windows with plan view, altitude view, and squawk list
- Selectable 3D solid model images for players
- Auto-follow, auto-zoom
- Measuring devices (players, mouse, ground points, range, bearing, etc)
- Approach lines and glide slopes for takeoff/landing
- Ground points with bulls-eye circles
- Track plotting tools, map drawing tools
- Recording/playback
- Exclusion zones (ingress/egress events)
- Range Safety object impact prediction and other related tools
- Configurable map items, colors, transparency, layering, raster images, shape files, BFF files, map management tools



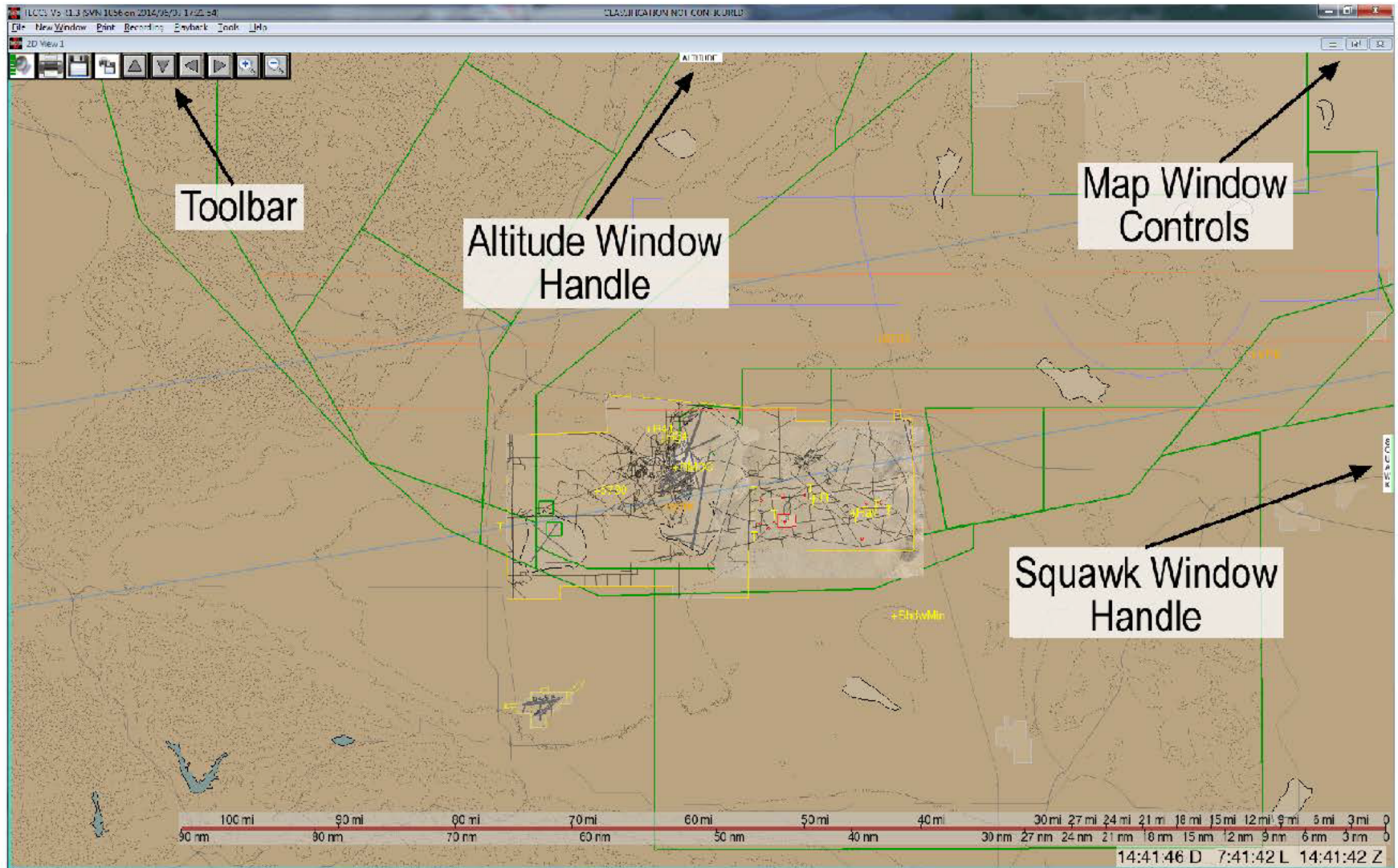
Out-Of-The-Box Data Receivers

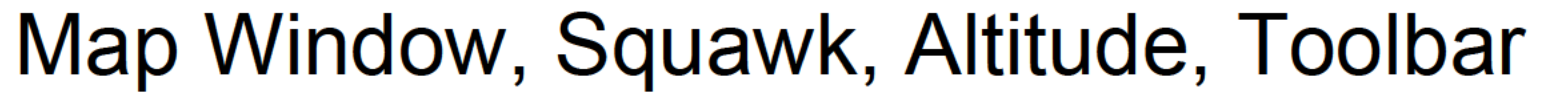


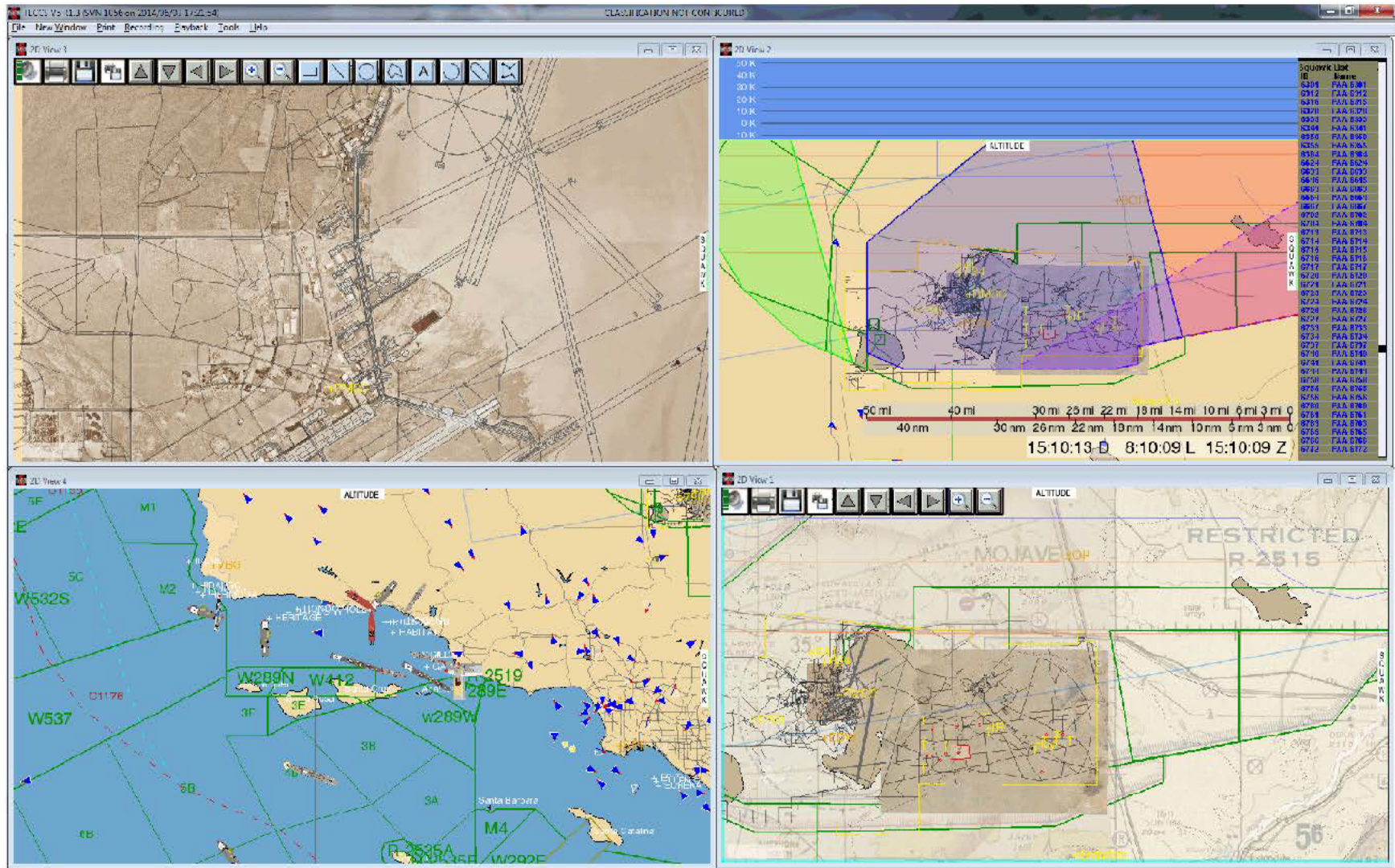
- Legacy TECCS messages (requires a firewall rule)
- Newer multicast standard TECCS messages
 - Messages from TECCS peripheral converter units
 - FAA, ARDS, RADAR, PETS
- RTDIR data feeds (Pt. Mugu, China Lake)
- FAA network data feeds (STARS)
- FAA data feeds through NUNIO converter
- Will handle native CRIIS real time messages (future)



Screen Layout and Controls









Panning and Zooming



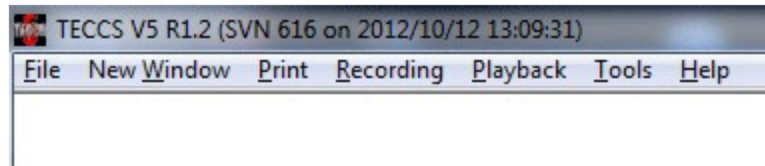
- Pan and Zoom using the Keyboard:
 - Arrow keys, Page Up, Page Down
- Pan and Zoom using the Mouse:
 - Using window Toolbar buttons
 - Pan by Dragging Mouse Cursor
 - Zoom using Mouse Wheel
- Modifier Keys:
 - Shift key: Pan and Zoom x 2
 - Control key: Pan and Zoom ÷ 2
 - Work with keyboard and mouse



Main Application Menubar



- Located at the top of the main window frame
- Contains “Global” functions and tools that affect ALL of TECCS and ALL windows



Map Window Toolbar

- Located below Altitude Window of Map Window frame
- Toolbar can be hidden/shown
- Buttons only affect local Map Window
- Buttons can be grouped, rearranged, hidden/shown
- Features can add their own buttons
- Mouse-over Tooltips

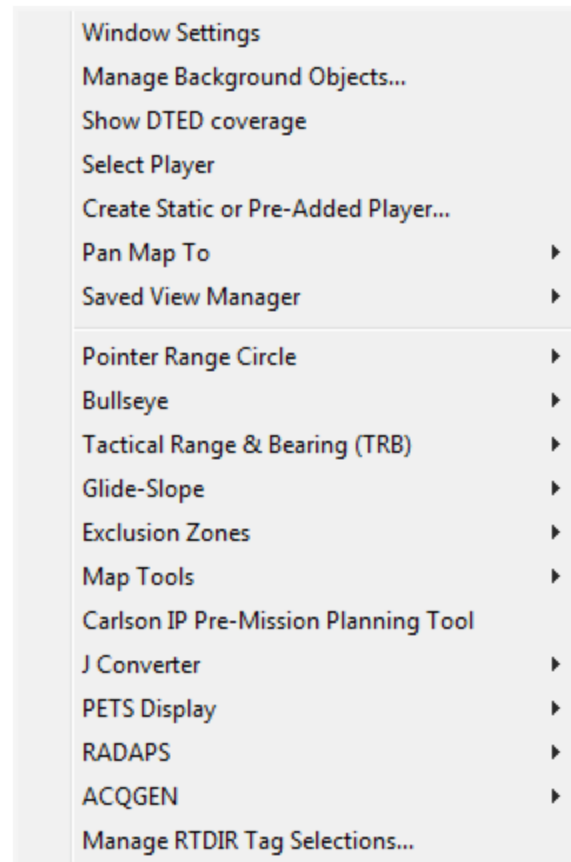




Background Context Menu



- Right-click on the background map in an area void of any players
- Most items only affect the window that menu was opened in

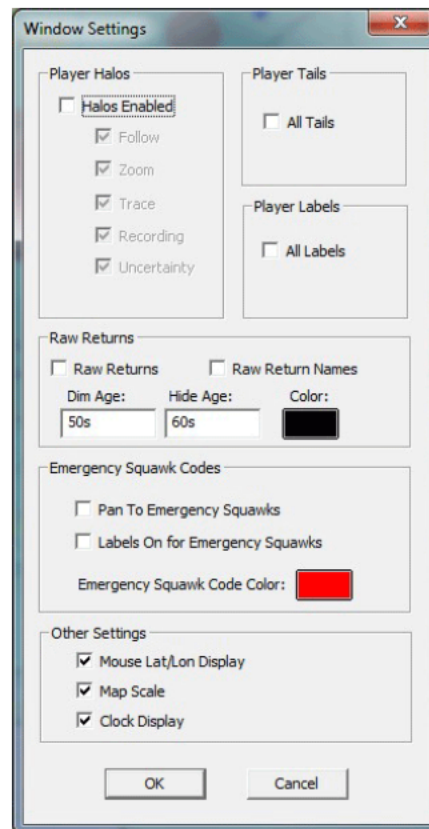




Managing the Window



- Window Settings:
 - Accessed from Background Context menu
 - Only affects window that dialog was opened in

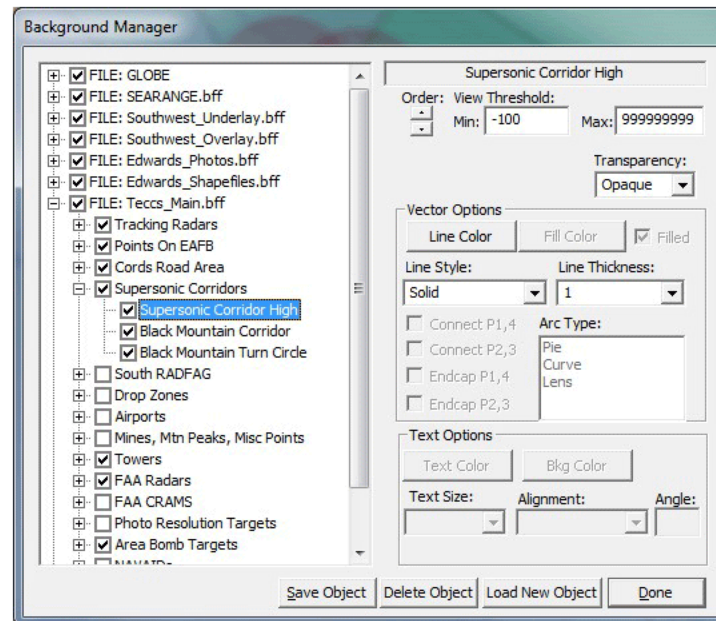




Managing the Background Map



- Background Manager
 - Accessed from Background Context menu
 - Modify map object attributes
 - Load, delete, save map objects
 - Only affects window that dialog was opened in

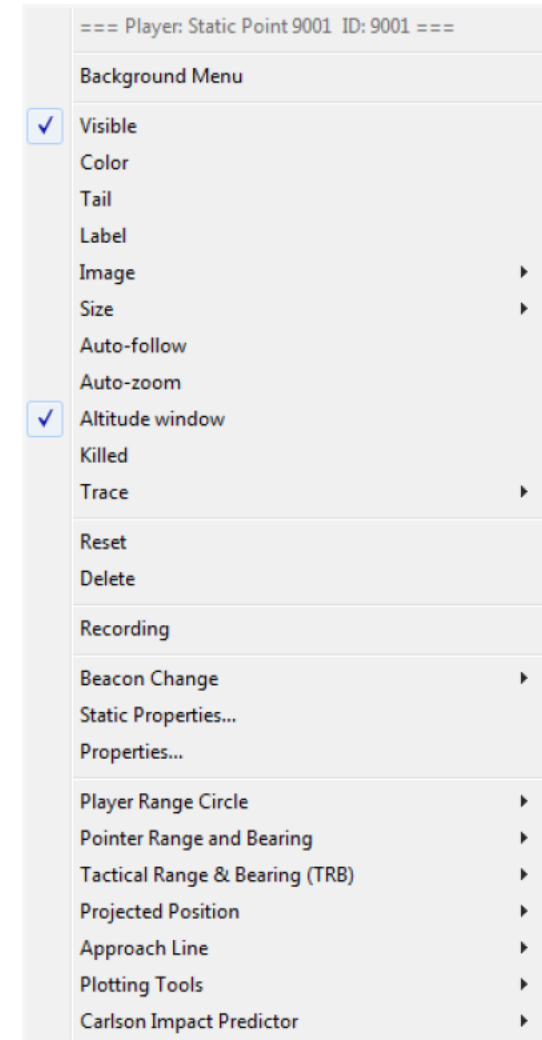




Player Context Menu



- Right-click on a player or group of players
- Contains player attributes, functions and features
- Menu items only affect currently selected players





Managing Players



- Player Properties
 - Accessed from Player Context menu
 - Modify selected players attributes
 - Only affects window that dialog was opened in

Player Properties

ID 9001 Name Bandit 03 Save Cancel

Image F-16 Falcon EAFB

Image Size Normal 1 Label Size 12 Point Color [Black]

State Toggles

- ☒ Visible
- ☐ Tail 60 Sec
- ☒ In Altitude Window
- ☐ Killed
- ☐ Uncertainty Circle
- ☐ Trace
- ☐ Outline Image

Label Block Options

☐ Label Block On

Label Location

☒ Name

☐ ID

☐ Lat/Lon

☒ Altitude

☒ Velocity

☐ Gnd Spd

☐ Pos Sigma

☒ Roll

☐ Pitch

☒ Heading

☐ Age

☐ Type

☐ Trk Mode

☐ Data Time

Auto-follow

- ☒ Off
- ☐ Both views
- ☐ Plan view only
- ☐ Altitude view only

Auto-zoom

- ☒ Off
- ☐ Both views
- ☐ Plan view only
- ☐ Altitude view only

Velocity Smoothing

Skip (sec) 0.0

Use (sec) 0.0

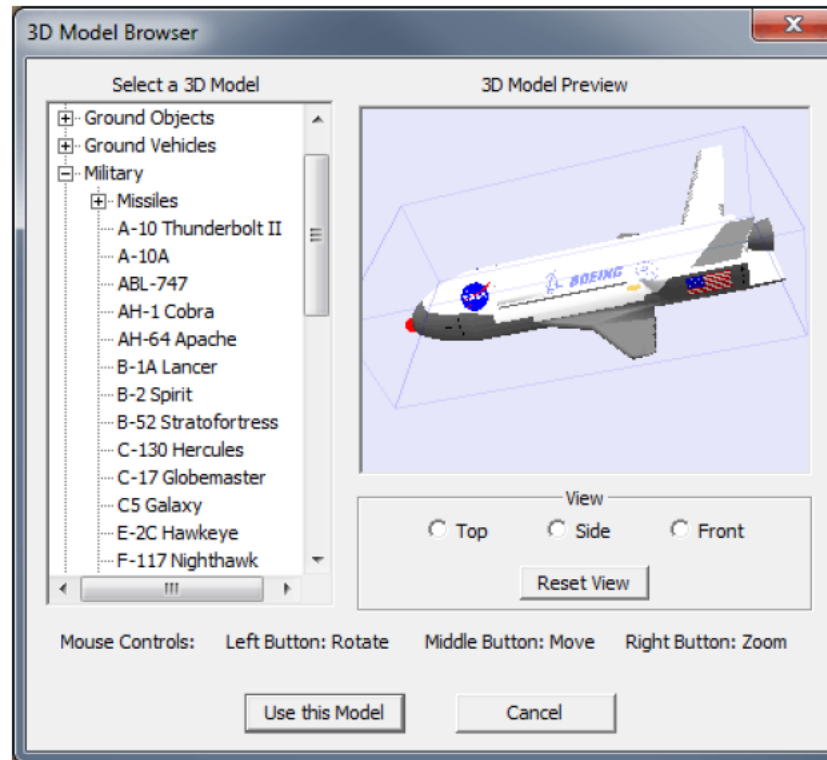
Reset Dialog



3D Model Browser



- View and select 3D models
- Rotate, pan, zoom models, view from top, side, front
- Add your own models, uses common 3DS model format

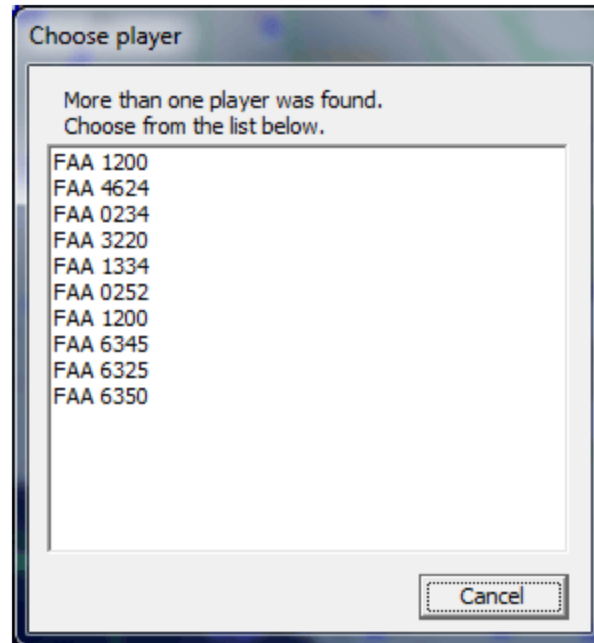




Player Deconflict

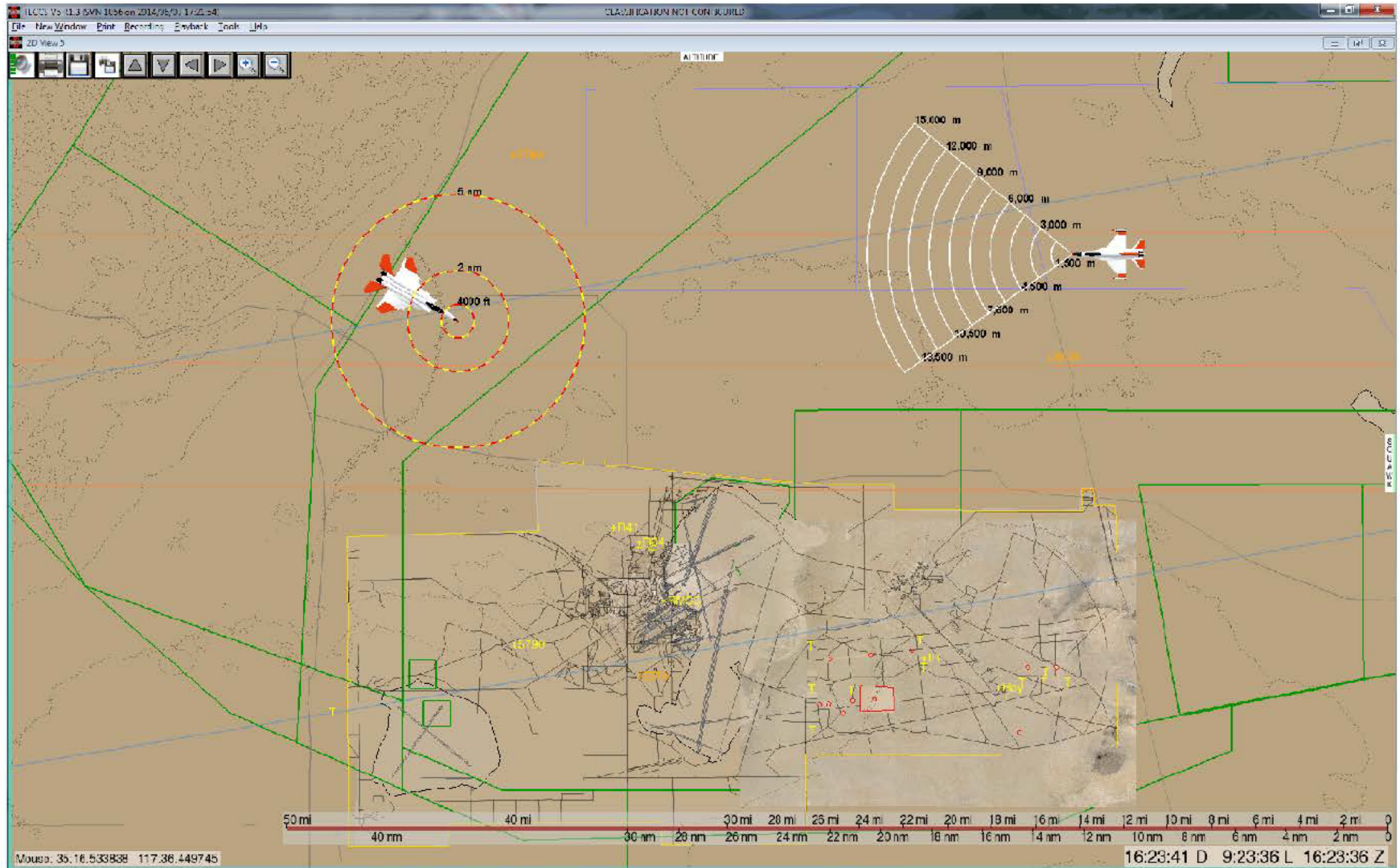


- Allows user to select a particular player when multiple players are in close proximity.





Player Range Circle





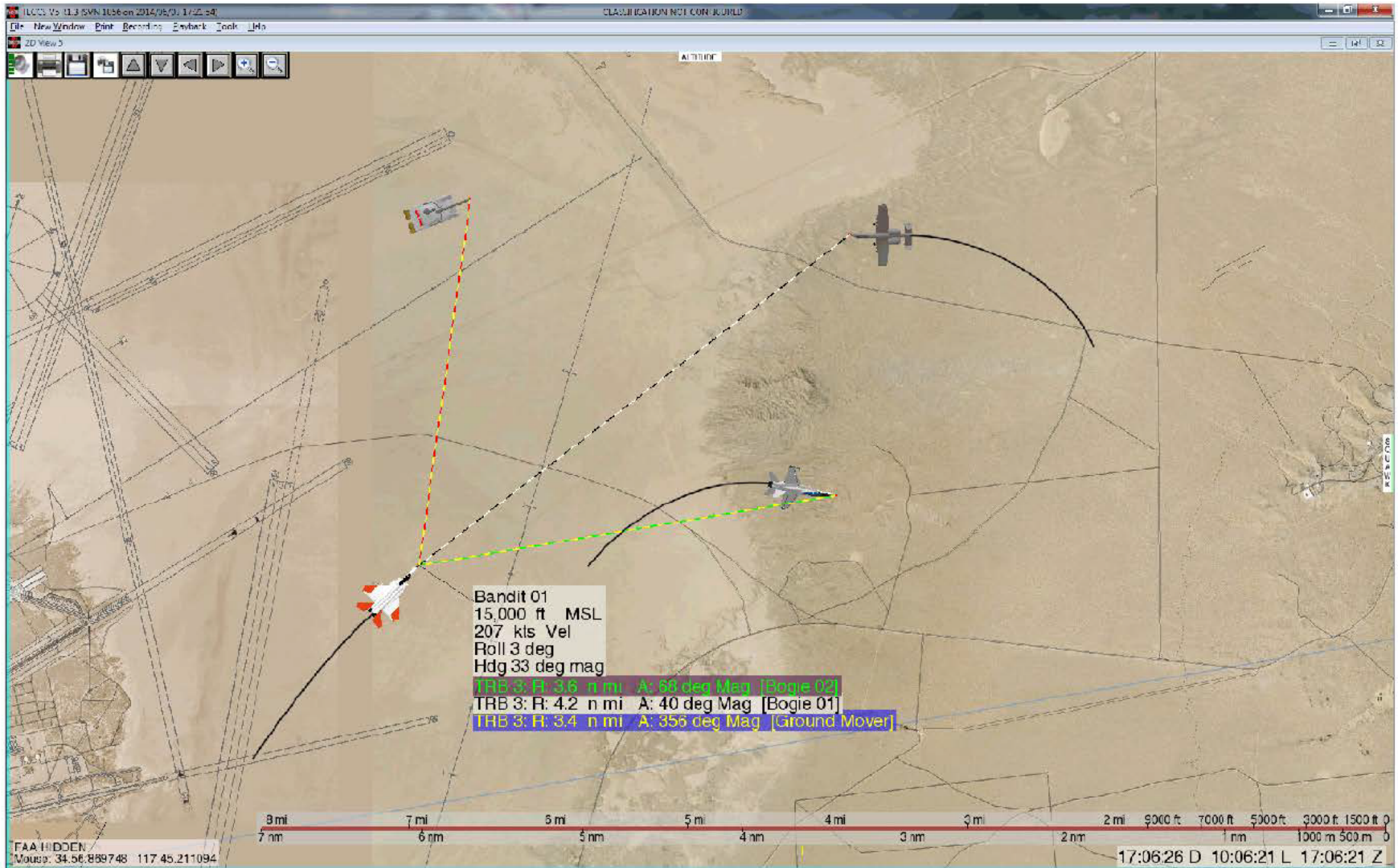
Player Range Circle



- Quickly and accurately measure distances from a player to other visible objects within the map window
- Consists of one or more concentric circles or arcs drawn at the track point of a player icon
- Options for displaying range markings and labels, line attributes, arc start and stop angles, angle reference



Tactical Range and Bearing





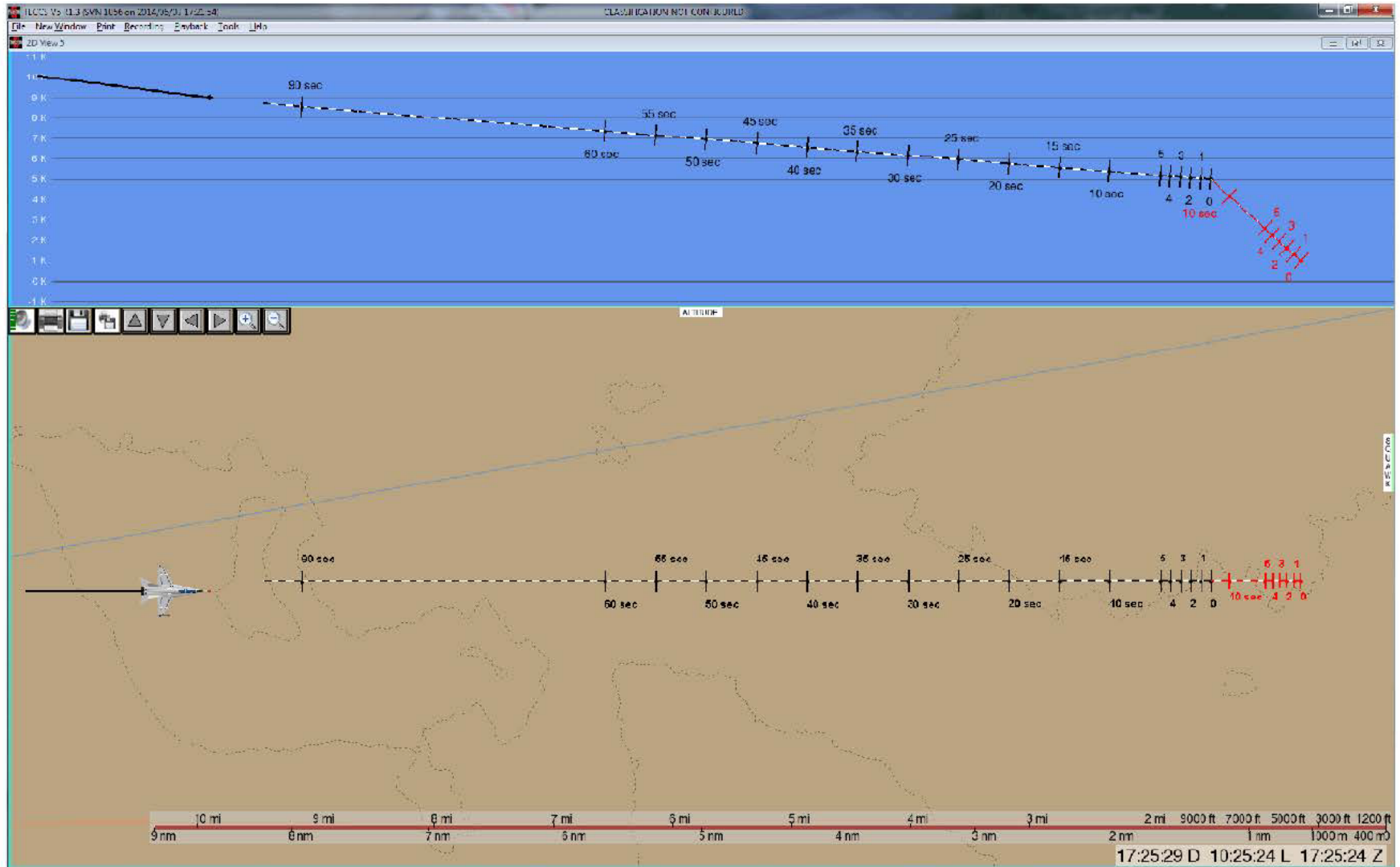
Tactical Range and Bearing



- Display range and bearing information from one source to one or multiple destinations
- Display Range and Bearing, RAE, or XYZ
- Heading can be referenced to True North, Magnetic North, or Player Heading
- Source and destination locations can be chosen using any combination of Mouse Position, Lat/Lon/Alt, Locations Database, Sensor Database, and Player location
- TRB label can be pinned to fix location on screen or follow player



Approach Lines





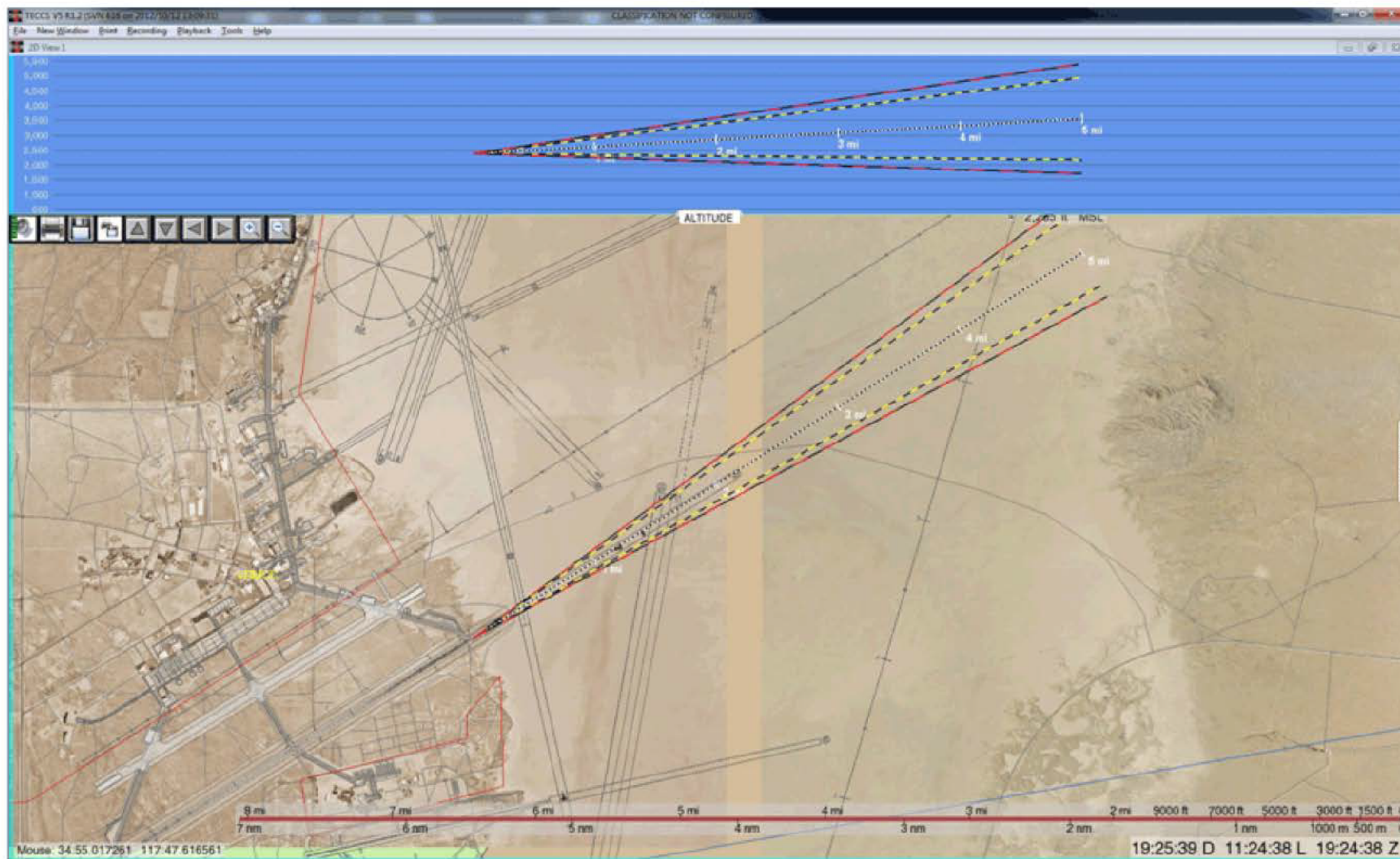
Approach Lines



- Run-in and Push-over lines
- Visible in map and altitude windows
- Static or Dynamic timing-tick marks
- Can include a weapons footprint
- Location can be chosen using:
 - Mouse Position
 - Lat/Lon/Alt
 - Locations Database
 - Sensor Database
 - Player location
- Dynamic help information based on approach line type



Glide-Slopes





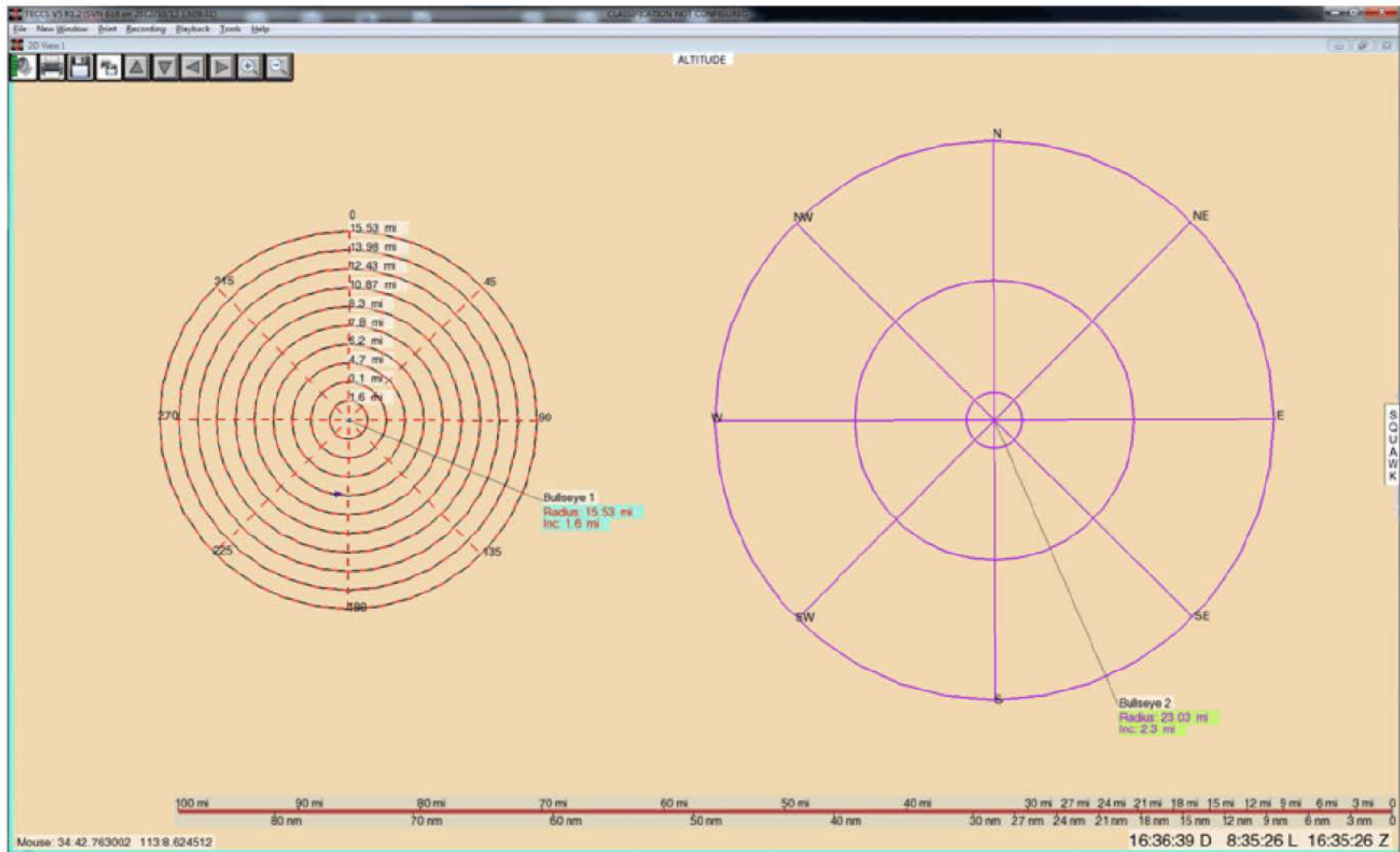
Glide-Slopes



- Display runway approach angles with vertical and horizontal limit lines in both the map window and the altitude window
- Select location using the Mouse or Runways Database
- Complete control over all Glide-Slope parameters and visual attributes
 - Slope position, length and angle
 - Vertical and horizontal limit line angles
 - Line appearance, visibility, distance ticks on/off
- Can be used for take-off and departures



Bullseye Display





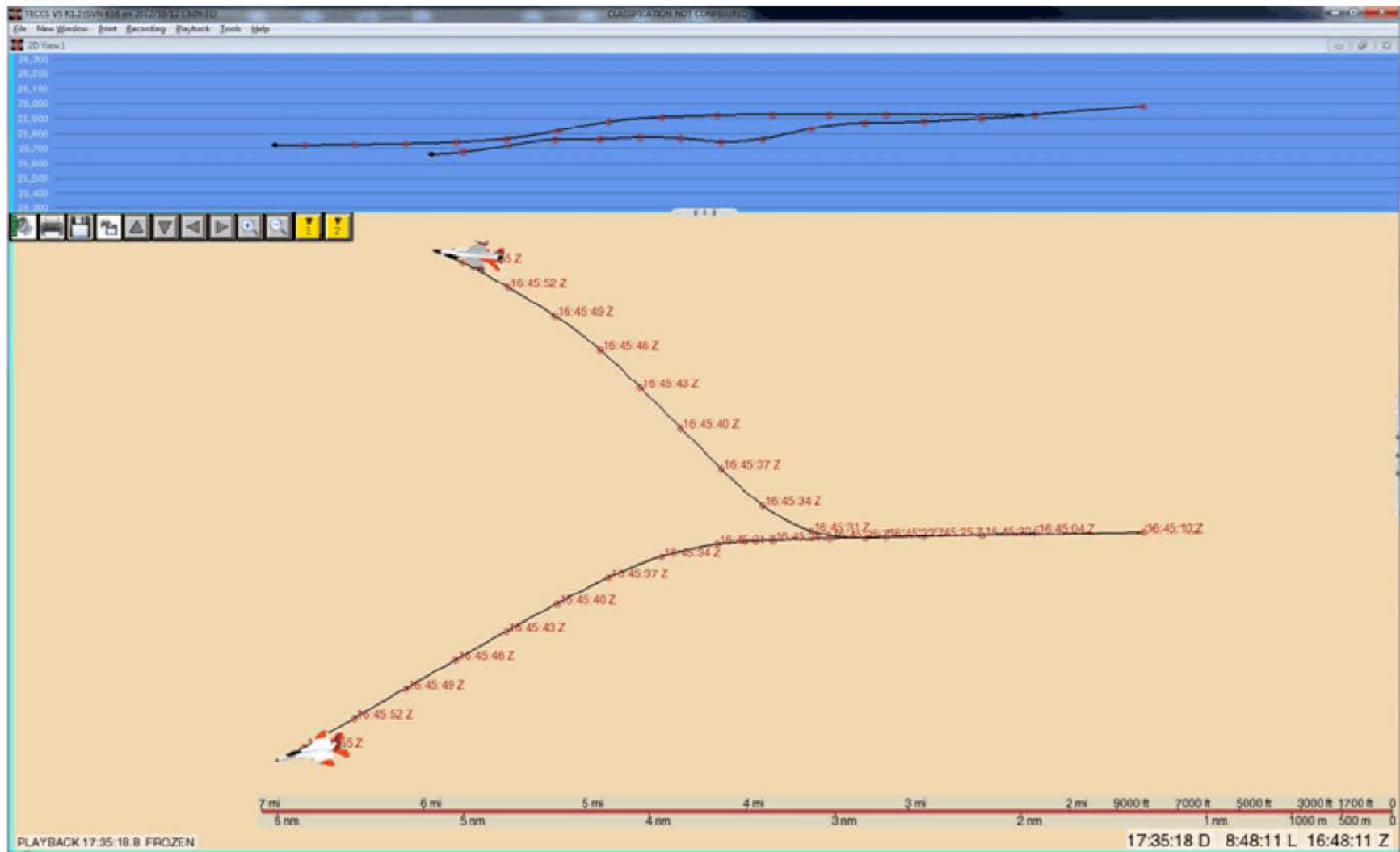
Bullseye Display



- Display a bull's eye pattern of concentric range circles or arcs
- Can be used for marking targets or mission assets where range and bearing information may need to be discerned
- Optional angular or cardinal heading labels
- You can perform same actions and apply same features to a Bullseye as you can a player



Plotting Tools





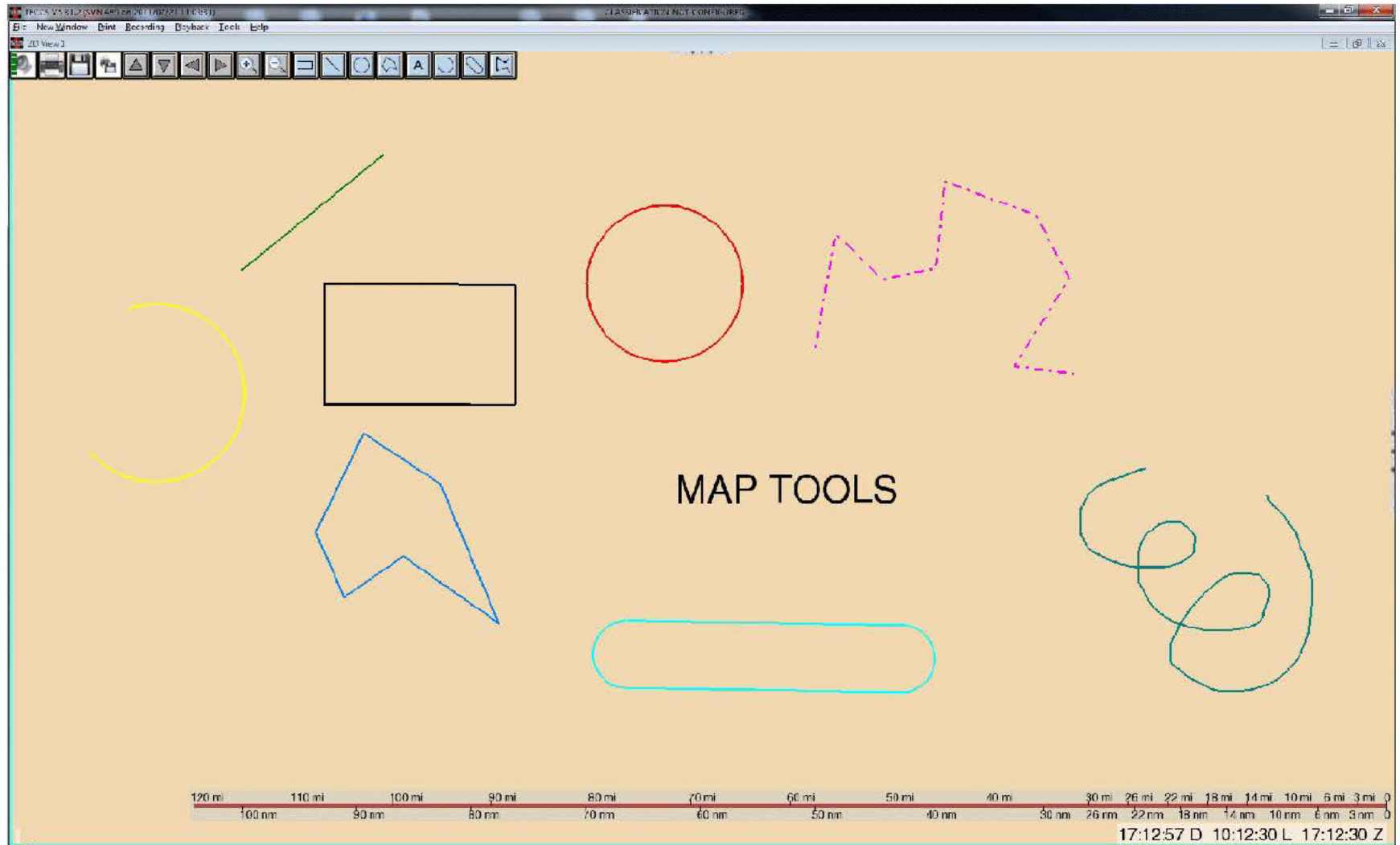
Plotting Tools



- Emulates old XY plotting boards
- Plot or trace a player's trajectory in the map and altitude windows
- Optional real-time clock timing ticks and timing labels
- Modify, control, view, and save the trajectory plots
- Control the visual attributes and interval of the plot's optional timing ticks and labels
 - Plots become Background Features
 - Manage using Background Manager
 - Save and reload plots



Map Tools





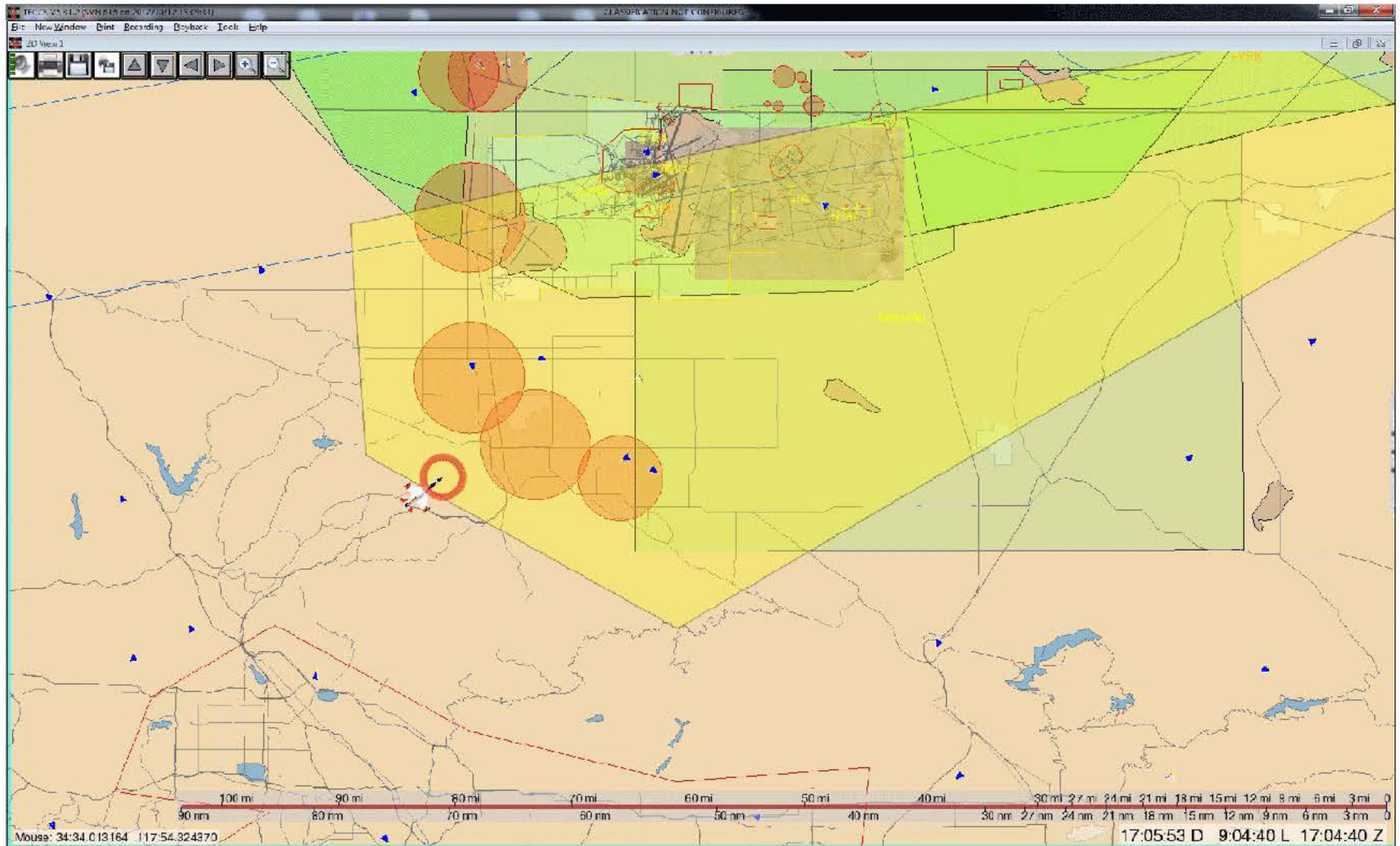
Map Tools



- A set of tools that can be used to draw various shapes and objects on the map window
- Drawn map objects and shapes can be saved for later use
- Contains tools for the following shapes and objects:
 - Rectangles
 - Lines
 - Circles
 - Polygons
 - Text
 - Arcs
 - Racetracks
 - Connecting Points
 - Free draw mode
- Shape and object points can be entered using any combination of Mouse Position, Lat/Lon/Alt, Locations Database, Sensor Database, and Player location



Exclusion Zones





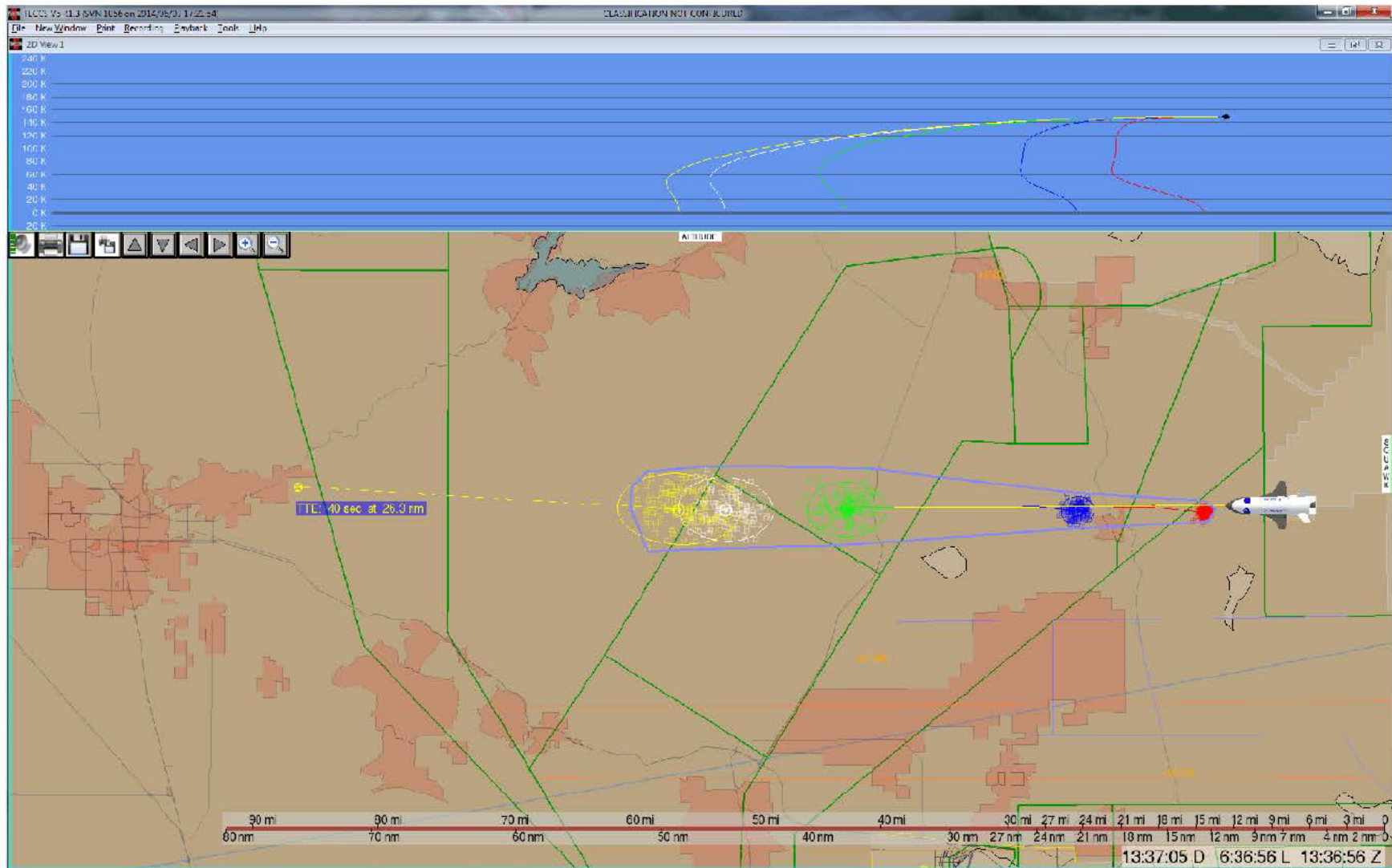
Exclusion Zones



- Exclusion and Inclusion Zones (EZ's)
- Zones or areas on the map display that will cause a visual and/or audible alarm to trigger when a player enters (ingresses) or exits (egresses) an area
- EZ's can be drawn and saved using Map Tools
- Useful for restricted areas, airspaces, no-fly zones, vehicle access control, shot boxes, drop zones



Carlson Impact Predictor





Carlson Impact Predictor



- Time To Endanger display – display distance and ETA of closest impact point to any location on the map
- IP Snapshot - save and document graphical snapshots of all CIP's when notable events occur
- Quick Pick feature – quickly switch CIP to best source when multiple tracking sources are available
- Customizable – customized CIP configuration templates can be pre-defined



Carlson Impact Predictor



- Single or multiple objects
- Real-time Monte Carlo uncertainty calculations
 - Specify uncertainties for:
 - Vehicle: position, velocity, pitch, heading
 - Wind: speed, velocity
 - Object: area, mass, drag
 - Impact uncertainty ellipses for 50%, 90%, and 95% probabilities
- Impact Altitude determined by DTED or fixed altitude
- Import weather files from web/network and CDROM
- Atmospheric model up to 3 million feet



Carlson Impact Predictor



CIP “Tabbed” User Interface

Carlson IP Settings

Atmosphere & Ground | Display Settings | Uncertainty Settings

Atmosphere / Wind Settings

Primary (Low): EAFB_Force_Reference_Atmosphere_Annual_vrx.val

Secondary (Mid): <None>

Fill up to 5,000,000 feet (High) with 1076 U.S. Standard Atmosphere with:

Wind speed: 0.000 knots Wind from: 0.000 deg true north

☒ Smooth transitions between atmosphere layers

Ground / Impact Altitude Settings

Expected impact altitude:

☐ Use DTED impact altitude

☒ Use fixed impact altitude: 2000.000 feet above ellipsoid

Atmosphere & Ground
Tab

Carlson IP Settings

Atmosphere & Ground | Display Settings | Uncertainty Settings

IP Object Settings

IP Name: 011V Eve Hags

Select Object: ALL OBJECTS

☒ Object display items

- ☒ IP impact points
- ☒ Trajectory lines
- ☒ Impact labels
 - ☒ IP name
 - ☒ Object name
 - ☒ Player name
 - ☒ Heading at impact
 - ☒ Total velocity at impact
 - ☒ Impact position
 - ☒ Time of flight
- ☒ Cycle through standard colors

IP Display Help Settings

☒ Real-time Monte Carlo

☐ Show Outline

☒ Show Points

☒ Ellipse

☐ 50% Prob

☒ 90% Prob

☐ 95% Prob

To calculate point count:

☐ Use 10 samples

☒ Use 3.2 seconds

Display Settings
Tab

Carlson IP Settings

Atmosphere & Ground | Display Settings | Uncertainty Settings

Tracking / Sensor Uncertainty Settings

1000.000 Position sigma, feet

10.000 Velocity sigma, feet per second

0.500 Height path pitch angle, deg

0.500 Flight path heading sigma, deg

Atmosphere / Wind Uncertainty Settings

0.000 Wind speed sigma, knots

0.000 Wind direction sigma, deg

Object Uncertainty Settings

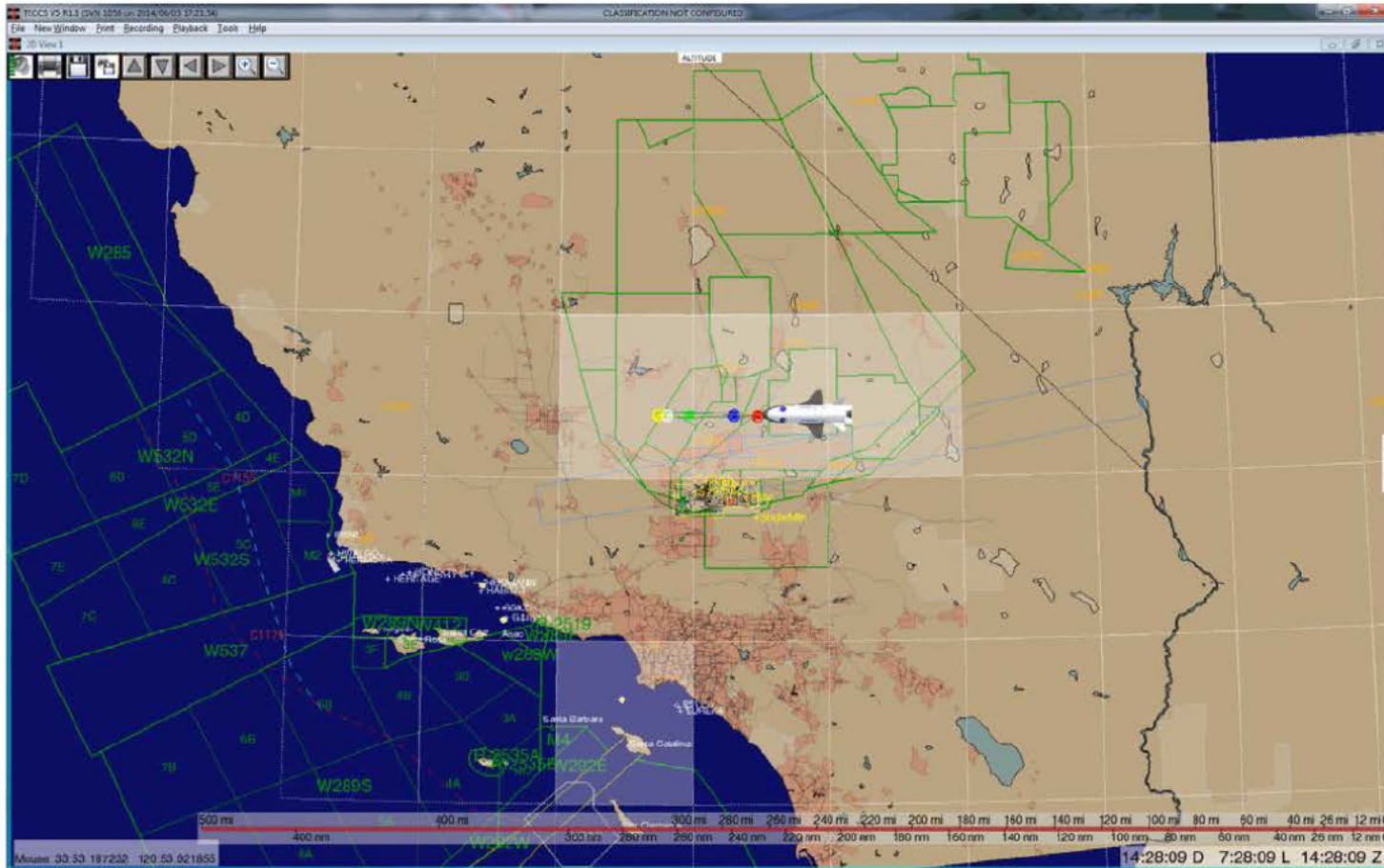
Select Object: Intact Vehicle

0.000 Object area sigma, square feet [0.0 - 79.009]

0.000 Object mass sigma, pounds [0.01 - 7700.000]

0.0000 Object coefficient of drag sigma [0.0 - 1.0000]

Uncertainty Settings
Tab

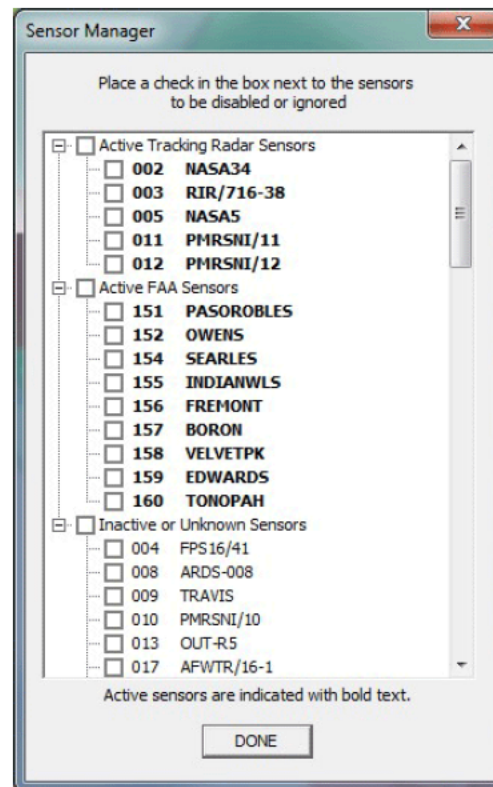


- DTED areas are loaded automatically from disk as needed
- Show DTED command displays available and loaded DTED areas



Sensor Manager

- Used to configure tracking sensors to use and ignore
 - Organizes sensors into groups or categories
 - Separates active and non-active sensors

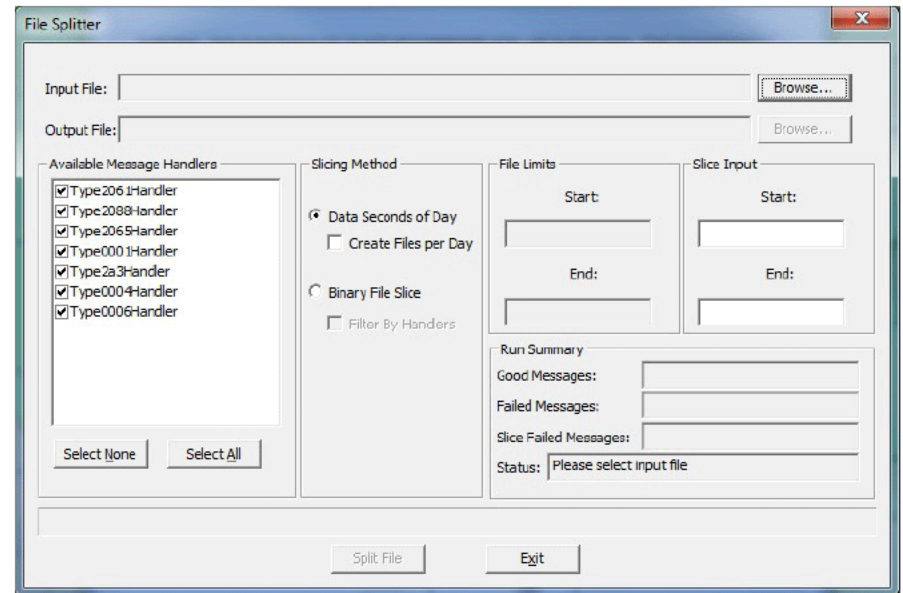
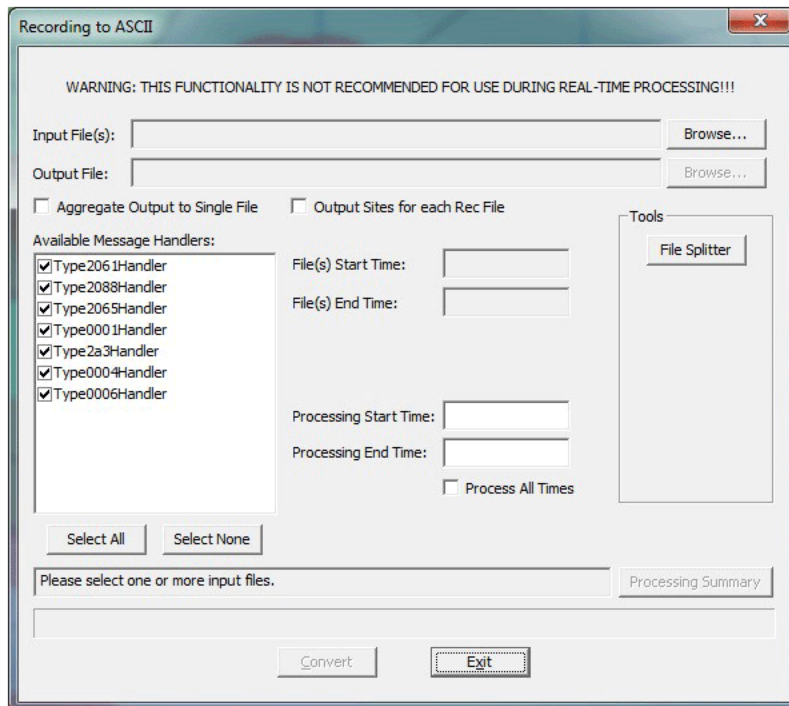




Recording-to-ASCII Converter



- Convert binary recording files into human readable Engineering Unit (EU) converted ASCII text files:
 - Select specific time slices or data message types
 - File-Splitter to extract time slices and save to new file





Sound Manager



- Used to control audio features and capabilities
- Sound Priorities:
 - Preempt lower priority non-critical sound events
- Priority pre-sounds

The Sound Manager dialog box contains a table with sound priorities and their settings. At the bottom, there are buttons for Pause, Mute, and a 'Mute Sounds For' section with a 30-second timer and a 'Done' button.

Priority	Snooze	Duration	Status
No Priority	[Snooze]	30 Sec	Sounds Enabled
Priority 1	[Snooze]	30 Sec	Sounds Enabled
Priority 2	[Snooze]	30 Sec	Sounds Enabled
Priority 3	[Snooze]	30 Sec	Sounds Enabled
Priority 4	[Snooze]	30 Sec	Sounds Enabled
Priority 5	[Snooze]	30 Sec	Sounds Enabled

Buttons: [Pause] [Mute] [Mute Sounds For: 30 Sec] [Properties and Sound Queue] [Done]

The Sound Properties dialog box features a 'Sound Queue' list, checkboxes for 'Pre-Sounds Enabled' (No Priority, Priority 1-5, Sound Interrupted, Sound Delayed), a 'Max Sound Play Time' of 5 seconds, and buttons for 'Remove Sound', 'Clear Queue', 'Done', and 'Cancel'.

Buttons: [Remove Sound] [Clear Queue] [Done] [Cancel]